

**Testimony to**  
**The United States House of Representatives**  
**Ways and Means Committee**  
**A hearing addressing:**  
**Reforming the Health Care Delivery System**

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Mr. Chairman, members of the committee ... thank you for the opportunity to share some of the background science, as well as applied experience, around the measurement and management of health care delivery quality, cost, and access. Those 3 topics form the foundation of health policy. They are often presented as a triangle, with each element interacting equally with the other two. I hope to convince you, drawing on modern quality theory and resultant care delivery application, that they are better seen as aligned in a row: Quality controls cost, and cost determines access to care. At the present time, the critical factor in rationalizing health care delivery in the United States is payment reform that leads to lower costs through higher quality.

I am a member of the National Academy of Science's Institute of Medicine (IOM), where I served on a number of committees addressing health system reform. In particular, I served on the IOM Committee on Quality of Health Care in America. In 2001, we published *Crossing the Quality Chasm: A New Health System for the 21<sup>st</sup> Century*. The IOM's prescription for health system reform, contained in that volume, is as timely and correct today than it was in 2001. It serves as a foundation for my testimony today. I hold Medical Informatics- and quality-related faculty appointments at a number of universities. Most important relative to today's discussion, I serve as the Chief Quality Officer at Intermountain Healthcare. Intermountain has been applying the principles of quality management for more than 20 years, at the front line, where policy theory comes face to face with patient care reality.

Intermountain Healthcare is a not-for-profit system of 23 hospitals, more than 100 outpatient clinics, and a health insurance plan. We have a very strong history, dating back to the mid-1960s, in developing and using electronic medical record systems for bedside care management. We supply more than half of all care delivered within the State of Utah, and supply tertiary services to the citizens of 6 surrounding states. We have been identified by external evaluators as one of the highest quality, most efficient care delivery organizations in the United States – or, for that matter, in the world. For example, the Dartmouth Atlas has asserted that if the rest of the country delivered the same sort of care that is found within Intermountain, national Medicare costs would fall by more than 30 percent while clinical outcomes would significantly improve. In addition to low health care costs, our rates of medical cost inflation are also among the lowest in the nation. Medical cost inflation in Utah is similar to consumer price index (CPI) inflation in the general Utah. For the rest of the country, medical costs are inflating at about twice the Utah rate (Exhibit 1). We sometimes shorten our mission statement to a single phrase: **The best patient outcomes at the lowest necessary cost.**

We stumbled into this course while doing fairly traditional health services research in the late 1980s. We were examining variation in care delivery practices, building on the work of Dr. John Wennberg. A colleague, seeing strong links, introduced us to Dr. W. Edwards Deming. Deming's "quality improvement" had transformed manufacturing industries world wide, redefining competition and customer-focused success. His theory centered around a key idea: In most circumstances, managing processes to increase quality should significantly reduce production costs.

We were one of the first groups to prove that Dr. Deming's idea worked within health care delivery. Intermountain had developed and deployed standard tools to accurately measure care delivery costs. We used those tools to add cost measures to a study of post-operative deep wound infections, already underway at Intermountain's flagship LDS Hospital in Salt Lake City. Deep post-op wound infections are the second most common cause of hospital-associated preventable patient injury and death. As we managed our operating room processes to consistently deliver prophylactic antibiotics within an ideal 2-hour time window, our deep wound infection rates plummeted. National standards at the time said that good hospital should have an infection rate between 2 and 4 percent. When we started, LDS Hospital had a rate of 1.8 percent – well below the best national standard. Some months later, the rate had fallen to 0.4 percent (Classen et al., NEJM, 1992). By reducing the infection rate, we avoided the costs of treating a large number of post-operative wound infections. Operating costs fell by almost \$1 million per year. This study became a foundation for a national effort to improve this aspect of patient safety across the nation (American College of Surgeons NSQIP initiative).

We went on to apply the same approach for more than 60 clinical processes within Intermountain. Most were projects undertaken as part of the Advanced Training Program in Clinical Practice Improvement (ATP). Since 1991, the ATP has trained more than 3,200 senior physician, nurse, and administrative leaders, drawn from across the United States and around the world, in clinical quality improvement. We now work with more than 35 “sister” clinical improvement training programs, started by graduates of our core course. Six are based outside the United States, in Australia, Singapore, Canada, Sweden, Argentina, and Israel. The rest serve major care delivery organizations within this country. Within the course, we organize and argue the evidence for quality-based health system reform: First, current health care delivery falls short of its theoretic potential in 5 key areas (despite that, care delivery today is still far better than that experienced by any previous generation of Americans) (footnote 1). Second, we know why it fails (footnote 2). Third, we have found proven solutions (footnote 3). From that foundation, a large group of U.S. care delivery organizations are rapidly advancing clinical improvement that produces cost savings.

In 1986, Jonsen defined the Rule of Rescue as “the imperative people feel to rescue identifiable individuals facing suffering or death” (McKie & Richardson, *Soc Sci Med*, 2003). Later commentators pointed out the interventions employed under the Rule of Rescue don't need to be effective – it's the effort that counts.

Rescue care corresponds closely to what Dr. Fisher described this morning as supply-induced demand. It is tightly associated with high-end technology, specialists, and procedural interventions. It stands in contrast to effective primary care networks, which are the main source of total health (how long and how well people live, primarily through behavioral and preventive care) and patient satisfaction (together, the “medical home” concept). The United States clearly outpaces any other country in the world in terms of rescue care. Rescue care is also the main source of cost differences between the U.S. and other countries. It is easy to list anecdotal examples of the spectacular saves that rescue care regularly generates. No one would want to forego those accomplishments.

Unfortunately, for every “save” there may be hundreds of patients who suffered small harms rather than benefits from rescue attempts, at greatly higher costs.

End of life care is a classic example of rescue care and its trade-offs. The Dartmouth Atlas has identified Intermountain as having very low expenditures in the last year of a patient’s life. After adjusting for age, gender, ethnicity, and burden of comorbid disease, we spend about \$12,000 per patient who dies. Hospitals in the Los Angeles areas spend almost 5 times more – about \$58,000 per patient. In many instances, this represents care that the patient did not want – in fact, care that the patient explicitly instructed their family to avoid. Intermountain’s approach centers around knowing and respecting the patient’s wishes, then tuning rescue care to those wishes. We have systems to help an elderly patient generate advance directives, then to pull those directives forward when the patient is hospitalized. We built palliative care review into routine ICU rounds, so that we can quickly support patients and families when death may be near. We have one of the highest hospice (special outpatient end of life care) rates in the nation.

We balance rescue care in other ways as well. To illustrate, pregnancy, labor, and delivery is the single biggest care process that Intermountain routinely executes. We deliver more than 32,000 babies each year. It helps generate operating income so that we can provide care in other, non-remunerative circumstances.

Late-stage pregnancy is often very uncomfortable for a mother-to-be. Obstetricians like to be able to schedule their work life, rather than simply let nature take its course. As a result, obstetricians often offer their late-term pregnant patients a technological solution: They can electively start labor through the use of a drug called pitocin (a.k.a. oxytocin). The American College of Obstetrics and Gynecology (ACOG) has published evidence-based guidelines to identify those circumstances in which elective induction of labor is safe for the mother and the baby. Chief among their criteria is a gestational age of at least 39 weeks (40 weeks is full term). A second important indication is the Bishop’s score – a 4-part physical exam that determines whether the woman’s body is ready to deliver. A high Bishop’s score – 10 or higher is the standard – is directly associated with much shorter lengths of labor, with much lower unplanned caesarean section (c-section) rates. While these appropriateness criteria apply to all deliveries, they have a much bigger impact for first-time deliveries (primiparous women).

We blended the ACOG criteria and Bishop’s scores into our workflow for labor and delivery. We saw inappropriate elective induction with gestational age < 39 weeks decline from 28 percent to less than 3 percent (Exhibit 2). Inappropriate elective inductions based on Bishop’s scores fell from over 15 percent of all first deliveries to less than 3 percent (Exhibit 3). As a direct result, our unplanned c-section rates fell. Intermountain has an overall c-section rate of about 20 percent, while the country as a whole remains much higher than 30 percent (Exhibit 4). Length of labor fell by about 45,000 minutes, across all patients, per year (Exhibit 5) (Oshiro *et al.*, *Obstet Gynecol*, 2009).

This translated into savings of more than \$10 million per year for mothers and their new babies, in variable costs alone. Lower lengths of labor means that we are able to deliver about 1500 more infants each year, without adding a single labor & delivery room or a single additional nurse.

It also means that Intermountain lost money as a care delivery system. For example, our clinical leadership estimates that it might be possible to reduce our unplanned c-section rate by about 2 additional percentage points. Our operating margin per average normal delivery, from commercial insurance, is \$282 (we lose about \$130 on every Medicaid delivery). An unplanned c-section, on the other hand, generates an operating margin of \$651. Dropping our unplanned c-section rate by 2 additional percentage points would decrease Intermountain's operating margin by \$1.8 million. Insurers' labor & delivery payments to Intermountain (including Medicaid) would fall by about \$8 million. Should Intermountain invest the substantial internal political and organizational resources necessary to drive our c-section rate down by another 2 percentage points?

Another improvement initiative, conducted in 1999, addressed appropriate medications prescribed at discharge for patients with heart disease (Lappe *et al.*, *Ann Intern Med*, 2004). We improved performance from 57 percent (among the best in the country at the time) to 97 percent (Exhibit 6). That saved more than 450 lives per year among patients suffering from congestive heart failure (CHF) or ischemic heart disease (IHD). It also reduced hospital admissions to Intermountain facilities by more than 900 patients per year. Intermountain lost more than \$3.5 million in revenues, as a direct consequence of improving our care – money that we had to make up from other sources. Should we have invested in improving the care?

The answer to both questions is obvious: Of course we should improve the care. Our patients, and their lives, come first. But as we struggle to survive financially, so that we can continue to provide services to our communities in the future, we are forced to cross-cover these losses from other sources. As important, perverse payment mechanisms sap the resources necessary to drive future improvements.

From a policy perspective, a few key factors emerge:

- One hundred years of science has massively increased our understanding of the human organism in health and disease, and given modern medicine literally thousands of ways to intervene to change a patient's future. At the same time, complexity has increased to the point where it "exceeds the capacity of the unaided expert mind" (to paraphrase Dr. David Eddy, the father of evidence-based medicine). As a result, health care delivery has become a team sport. The healing professions are in the midst of a profound shift, on a scale not seen in over 100 years. We are transitioning from a care delivery model based around personal excellence – clinicians seen as stand-alone experts, who say "in my experience" then deliver care showing massive variation and, sometimes, questionable results – to one where care is delivered by coordinated groups. **As a direct consequence, the large gains shown through clinical improvement are mostly limited to organized group practices or**



**integrated delivery systems.** This relates closely to quality measurement and accountability. In today's care delivery setting, it is very difficult to attribute clinical results to any one physician or hospital. **Very often, public accountability is meaningful only at the level of groups.**

- Health care delivery in other modern industrialized nations – for example, Canada, Australia, and the countries that make up the European Union – show exactly the same set of failings, on a similar scale, as those found in the U.S. Those failing track back to the same causes, and lead to the same patient care solutions. This suggests that **effective health reform arises at the patient interface within our own country, not in policy solutions borrowed from other countries.**
- **Team-based care delivery rationalizes the emerging role of electronic medical record (EMR) systems.** It is impossible to broadly implement bedside clinical process management – higher quality driving lower costs – without EMR tools. At the same time, process management tools provide structure to the care delivery environment, so that well-proven data automation methods can work within health care delivery. EMR initiatives that do not take advantage of this natural relationship are very likely to fail.
- It is essential to appropriately protect patient privacy, while still being able to use clinical performance data to improve care. There is a real risk that extreme privacy regulation will significantly damage our ability to deliver excellent care, while not substantively improving patient protections.

While Intermountain's initial clinical "projects" showed impressive results, we were not able to consistently deploy the results broadly. In almost all circumstances, they happened around a single clinician – the person who did the project in the ATP – but did not move beyond that limited setting. In 1995, Intermountain launched a major internal initiative to make clinical quality our core business strategy. Over the last 10 years, we built the measurement and management infrastructure necessary to deploy – to apply evidence-based best practice consistently at the bedside, across our entire system. In fact, the clinical examples that I shared earlier – the labor & delivery case study, appropriate cardiac medications on discharge, and the widespread deployment of infection control – were the fruits of that strategic initiative. I have more than 50 additional examples that I could share, given sufficient time.

Today Intermountain is able to show system-wide, significant improvements in patient care outcomes, across a broad array of key clinical processes. Not surprisingly, our operating costs have also fallen significantly. We are not alone in these successes. Other care delivery groups – the Mayo Clinic, Geisinger Health Care, the Dartmouth Hitchcock Health System, and many others – are showing similar advances.

For today's discussion, though, I wanted to concentrate on 2 key findings:

**1. Quality-related waste is rampant in current health care delivery.** Quality theory classifies the cost savings illustrated in the proceeding projects as quality-related waste. It provides a robust set of tools for identifying such waste. More important, the structure of the analysis links waste identification to effective action to improve care and reduce costs. Quality waste is actionable waste.

Working under a grant funded by the DHHS Agency for Healthcare Research and Quality (AHRQ), we recently developed a synthetic model for quality-related waste in hospitals. While we identified 5 major waste categories, we were able to generate estimates for only 2 of them. We still found that almost half of all resource expenditures in U.S. hospitals are quality-related waste.

A final version of our report is currently under review for publication. We therefore refer interested parties to the final AHRQ technical report (AHRQ Final Report), pending full publication.

We estimate that, to date, Intermountain has eliminated more than \$100 million in structural operating costs by using quality improvement tools to address quality-related waste. Given the amount of quality waste in the system, though, that amount is a mere down payment. Much larger opportunities await.

**2. Under present payment mechanisms, when health providers remove waste – when we improve clinical outcomes and reduce our operating costs – we are punished financially.** I have already given 3 examples of quality-related improvements in cost structure that damaged Intermountain's financial survival. A fourth example contains more detail:

In 1995, Intermountain's Dr. Kim Bateman developed an evidence-based best practice guideline for community-acquired pneumonia. He blended the guideline into clinical workflow, with an embedded data system. It focused around 4 main factors: (1) Whether a patient was hospitalized, or treated in an outpatient setting; (2) Choice of initial antibiotics; (3) Speed of introduction of intravenous antibiotics for hospitalized patients; and (4) A conversion protocol to quickly shift hospitalized patients back to an outpatient setting.

In an initial trial of his new protocol, physician compliance with recommended antibiotics increased from 22 to 40 percent (Exhibit 8). In conjunction with this moderate improvement in better antibiotic choices, the proportion of patients suffering a major complication while hospitalized fell from 15.3 to 11.6 percent (a 24.7 percent relative decline); mortality rates fell 7.2 to 5.3 percent (a 26.3 percent relative decline); and total costs of care delivery fell by 12.3 percent (Exhibit 9). Today, compliance with the Intermountain lower respiratory infection protocol runs just under 90 percent, across more than 1,000 physicians spanning more than 800 miles – much higher than in the initial trial. It saves about 70 lives per year across the Intermountain system, and drives

several million dollars per year in structural cost savings (Dean *et al.*, *Am J Med*, 2001; Dean *et al.*, *Chest*, 2006).

The problem: While costs fell by 12.3 percent (about \$1.2 million across the 9 test hospitals in the original trial), reimbursement fell by 17.5 percent (over \$1.7 million). The difference between cost reductions and reimbursement drops totaled 5.3 percent, a more than \$500,000 shortfall.

We tracked the differences back to variation built into the Medicare DRG reimbursement system. If a patient had a complication, they move out of the “standard” community-acquired pneumonia DRGs (DRGs 89 and 90) into one of a list of about 30 DRGs associated with more severe disease. The most common shift was into DRG 475, Long-Term Ventilator Support. In 1995, DRG 475 paid Intermountain about \$16,400 per case. Our true costs of care delivery were about \$15,600 per case, so Intermountain made about \$800 in operating margin on every pneumonia patient who suffered that sort of complication. By implementing the best practice guideline, we were pulling patients back from DRG 475 (and related “complication” DRGs) into DRG 89. In DRG 89, our true cost of care delivery was about \$4800, while reimbursement was only \$4400. In that subset of patients where better evidence-based care produced fewer complications and lower mortality, we went from a \$800 positive operating margin to a \$400 negative operating margin.

Mr. Mark Baird helped me conduct a detailed financial analysis, examining a full list of the mechanisms by which better care can reduce care delivery costs, played through the range of payment mechanisms used in health care today. About three-fourths of the time, improved care that produced cost savings resulted in substantial financial penalties to the care provider. In those situations all of the savings flowed back to payers as windfall benefits. Within budgets already targeted to minimum survival margins (on the order of 2½ - 3 percent, where Intermountain attempts to operate), these shortfalls destroy the funds necessary to drive improvement projects, even for those care delivery organizations that are motivated primarily by professional goals of good patient care rather than financial gain.

Lessons learned:

- **Current government payment methods are actively perverse. Providers are paid more when they harm patients, and less when they improve patient results and produce cost savings. Providers have strong financial incentives to deliver more rescue care, even when the added tests, images, hospitalizations, and other treatments are of questionable benefit to their patients.** Most cost savings programs try to reduce the amount paid for a specific service (unit payment rates). Providers fill the shortfall by increasing the number of units supplied. They do more visits, more tests, more images, and more treatments. **The foundation for health system cost savings is utilization rates, not the amount paid per service.** The work of the Dartmouth Center for the Evaluative Clinical Sciences is particularly pertinent to this topic.



- **The key to understanding care delivery cost reform is operating margins.** (Most macroeconomists are not conversant with this approach.) For example, in the pneumonia project cited above, Intermountain would have remained financially whole if Medicare had been willing to pay \$5600 (\$4800 in costs, plus the pre-existing \$800 margin) for those patients with “prevented” complications. Medicare would have still seen a savings of \$10,800 per case (the \$16,400 Medicare paid for DRG 475, versus the \$5600 “appropriately” paid for a case returned to DRG 89 by better care).
- When working on clinical processes primarily funded through commercial insurance, Intermountain has been able to negotiate payment based around the demonstrated savings produced by improved care. Everyone benefits: Patients get better outcomes, purchasers get lower costs, and health providers get sufficient payment to remain financially viable. **Government-funded care does not provide similar opportunity for innovation and improvement.** It is not possible to negotiate “best care” payment rates with CMS for Medicare patients. At the same time, CMS is poorly positioned to recognize and reward real improvement across a very large and diverse national health care delivery system.
- Across all Medicare inpatient services, CMS currently pays Intermountain 14 percent less than the true cost of care (not charges). To survive financially, we are forced to shift this payment shortfall to commercial payers. Within Intermountain, about half of all annual increases in charges arise from this source – a hidden “cost shift” that roughly doubles the apparent year-to-year cost increases associated with care delivery.
- You may have seen this pneumonia case study before. Reed Abelson, a reporter at the New York Times, used it as the heart of an article published on December 5, 2003 (front page, above the fold) entitled “Hospitals Say They’re Penalized by Medicare for Improving Care.” This was one of the examples that led to the national pay for performance movement.

It also illustrates why **many forms of pay for performance don’t work.** For example, one major pay-for-performance system offers a 3 percent incentive to hospitals that score in the top decile of CMS pneumonia performance measures. However, measurement is difficult. Most current measures rely upon available data, and so miss key elements that determine real patient outcomes (such as choice of initial antibiotics). An extensive literature shows that, in most cases, such measurement systems cannot rank accurately (Goldstein & Spiegelhalter, *J Royal Stat Soc, Series A*, 1996; Andersson, Carling, & Mattson, *Chance*, 1998). As a result, many hospitals focus on the measurement system itself, where it is easier to “look good,” than on the difficult task of improving actual care performance. They score well on the CMS measures, but careful independent evaluations of patient outcomes show no change (e.g., Mangalat, Smith, & Butler, *J Card Failure*, 2008). Finally, a 3 percent performance incentive would have reduced Intermountain’s financial penalty from

5.2 percent to 2.2 percent. While that would soften the blow, it hardly counts as an incentive. It will be extremely difficult to build up a sufficiently detailed measurement infrastructure within a reasonable time frame, to drive sufficient cost savings for national health care reform through these sorts of pay for performance incentives.

- **The primary federal source of evidence and leadership for these activities is the DHHS Agency for Healthcare Research & Quality.** While this country has invested heavily in the search for better understanding of biomedical systems and new treatment interventions, we have not invested proportionally in our ability to deploy effective care to U.S. citizens.

In summary, the U.S. health care delivery system provides a massive opportunity to reduce costs by improving care. An array of successes, in many different care delivery groups, point the way. We have existing federal agencies who understand the problem. With adequate resources, they could lead a rapid advance. We have proven tools. Those tools center around cost control through the identification and elimination of quality-related waste. The key factor in releasing this capability is to align payment to quality. As quality improves and costs fall, obvious needs to provide health services to all Americans will come within reach, in a form that can sustain into the future.

Footnote 1

The 5 areas where current health care falls short of its theoretic potential are;

1. Massive variation in care delivery, to the point where it is impossible that all U.S. citizens, even with full access to care, are getting good care. Wennberg and the Dartmouth CECS group have demonstrated that this variation is an attribute of shared patterns of belief and practice within geographically-based care delivery communities. This literature leads to a telling conclusion: Where a person lives (and receives care) is more important than whether that person is insured in determining the actual health care that that individual will receive.
2. High rates of inappropriate care (ref: Robert Brooks). For some hospital-based treatments, as much as 32 percent of all care delivered was judged to be clinically inappropriate upon careful peer review. The criteria used were entirely clinical: Care was classified as inappropriate if the risk of the treatment outweighed its potential benefit to the patient. Inappropriate care ties very closely to rescue care, supply-induced demand, and preference-induced demand.
3. Unacceptable rates of care-associated preventable patient injury and death. The IOM's 1999 report, *To Err Is Human*, estimated that between 44,000 and 98,000 U.S. citizens die each year from preventable injuries sustained as part of care delivery in hospitals. Subsequent investigation has shown that these estimates are conservative (as the IOM Committee on Quality of Health Care in America originally claimed). On this basis, U.S. hospitals are somewhere between the 4<sup>th</sup> and 6<sup>th</sup> most common cause of preventable death, and a major public health concern.
4. Within a subset of treatments for which there is solid, non-controversial evidence of benefit, the U.S. health care delivery system manages to "do it right" only 54.9 percent of the time (McGlynn, *NEJM*, 2006).

While category 2 (above) constitutes overuse, this category 4 constitutes underuse. In other words, the U.S. health care system misses on both sides of the target. Overuse shows a strong correlation with technology- and specialty-based rescue care, driven by favorable reimbursement rates. Underuse shows a similar correlation with primary care, preventive measures, and poor reimbursement rates

5. U.S. health care demonstrates massive amounts of quality-associated waste, probably in excess of 50 percent of all expenditures. Again, this waste ties strongly to rescue care, supply-induced demand, and a heavy reliance on high technology medicine in specialty settings.

While other first-world industrial nations have not measured as carefully as has the United States, it appears that the same list of major failings operate in those countries on roughly the same scale as they do in the United States. The primary difference between the U.S. and our peer nations is a much heavier reliance on specialists, high technology,

and other forms of rescue care in the U.S., with parallel underfunding of primary care networks.

#### Footnote 2

The main source of modern healthcare's failure relative to its theoretic failure is continued reliance on a "craft of medicine" model of care delivery, in the face of rapidly increasing complexity. "Craft of medicine" is the idea of each clinician as a stand-alone expert, who practices mainly on the foundation of "in my experience." The head-on collision of craft-style practice and overwhelming complexity is framed by a payment system that heavily rewards rescue care, while not valuing preventive care.

#### Footnote 3

In most circumstances, it is not possible to generate an evidence-based best practice guideline that perfectly fits any patient. The people who approach the U.S. health care system to receive care differ genetically. Each individual thus has slightly different anatomy and physiology; each individual will thus respond differently to pathogens differentially encountered in the environment; and each will respond differently to treatment. This is compounded by different personal resources, as well as different values and preferences.

Lean quality theory (an extension of Deming's path breaking work) introduced the idea of "mass customization." Under that approach, evidence-based best practice guidelines become "shared baselines." To illustrate, within Intermountain we call together a full clinical team – physicians, nurses, therapists, technicians, pharmacists, social workers, and administrators. We hammer out an evidence-based best practice guideline fully recognizing that (1) we will not have solid evidence for many of the choices built into the guideline; and (2) that the final document will not perfectly fit any patient. We then blend it into clinical workflow, so that it becomes the lowest energy, default approach. We then demand that clinicians adapt the "shared baseline" to individual patient needs (hence the name "shared baselines"). With more than 50 running under active measurement at the present time, we know that clinicians will typically change (95% confidence interval) about 5 – 15 percent of a shared baseline to meet the unique needs of a particular patient.

We have shown that this concentrates our most important resource, the trained expert mind, on a relatively narrow band of issues most critical to each individual patient's care. Clinician time to manage complex cases drops dramatically. This represents a significant increase in productivity for the professionals involved. This approach also provides a framework to coordinate across teams of experts. It is the foundation for an effective electronic medical record. Interestingly, the key to appropriate variation is standardization, with embedded measurement and feedback.

Shared baselines also produce major productivity enhancement for care delivery organizations. It makes it possible to staff for a common baseline, train around it,

purchase supplies more rationally, provide educational materials for both patients and professionals, and otherwise organize a much more predictable, measurable, and efficient care delivery environment.



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December 2006



## COST OF LIVING INDEX

	Wasatch Front			National			
	Index Mar. 1988=100	% Change 6 Mos.*	(Non-Seas. Adj.) 1 Mo. Prior	Index Mar. 1988=100	% Change 6 Mos.*	(Non-Seas. Adj.) 1 Mo. Prior	(Seas. Adj.) 1 Mo. Prior
<b>All Categories</b>	<b>154.6</b>	<b>-0.1%</b>	<b>0.2%</b>	<b>173.4</b>	<b>2.7%</b>	<b>0.1%</b>	<b>0.5%</b>
Housing	182.8	2.7	0.1	175.6	3.8	0.1	0.4
Transportation	120.2	-11.4	-1.4	163.9	0.8	0.9	1.8
Health Care	<b>157.4</b>	0.1	-0.1	<b>249.5</b>	3.9	0.0	0.1
Food at Home	201.2	3.3	3.1	170.6	1.8	0.0	-0.3
Clothing	113.2	-1.6	0.6	102.9	0.2	-2.5	0.6
Food Away	162.2	0.0	0.0	168.7	3.2	0.3	0.3
Utilities	128.7	-1.0	0.0	175.4	3.1	1.1	1.2
Recreation	139.1**	5.8	0.0	109.8 <sup>†</sup>	1.3	-0.4	-0.3
Education & Comm.	124.6**	5.6	0.0	116.2 <sup>†</sup>	2.5	-0.1	0.2
Other Goods & Svcs.	104.3**	0.0	0.0	243.3	2.6	0.7	0.8

\*Last six-month percentage change compared with same period one year ago.  
 \*\* (Feb. 1998=100 base)

National Data Source: U.S. Bureau of Labor Statistics  
<sup>†</sup> (Dec. 1997=100 base)

Exhibit 1. Consumer price index (CPI) inflation in urban Utah (the “Wasatch Front”), compared to national rates. Source: Wells Fargo Bank.

## Elective inductions < 39 weeks

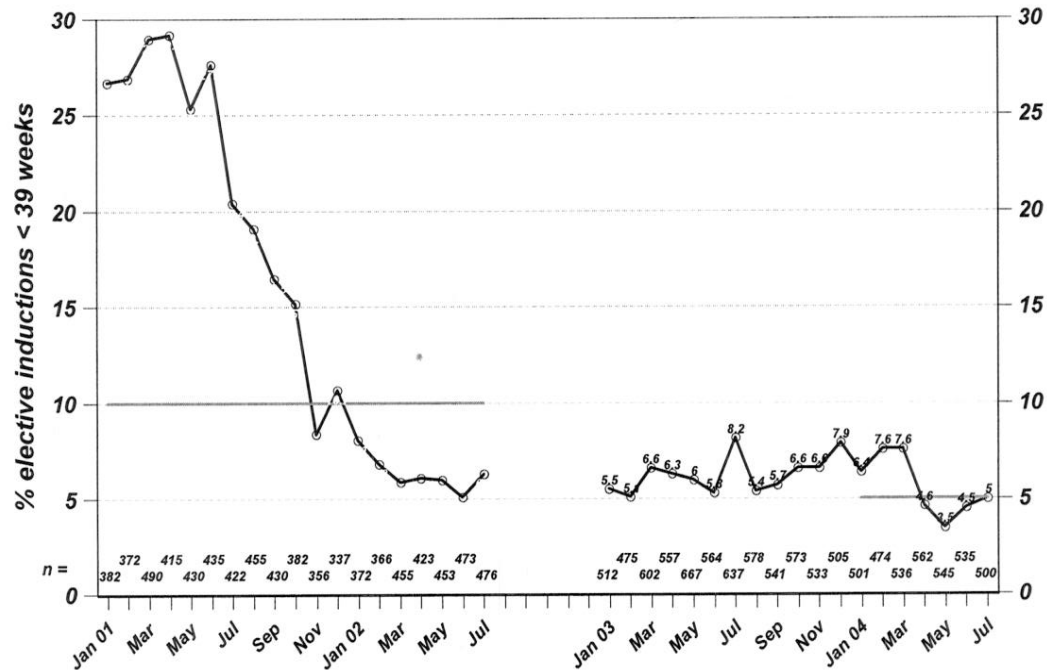


Exhibit 2. Inappropriate elective induction rates within Intermountain Healthcare, based on ACOG criteria of a gestational age  $\geq 39$  weeks. The graph tracks the time period of initial implementation. Rates today are below 3 percent, reflecting the limitations of the protocol itself (except in very rare circumstances, it is impossible to write guidelines that perfectly fit all patients; some level of adjustment, based on special circumstances of individual patients, is essential).

# Primiparous elective inductions

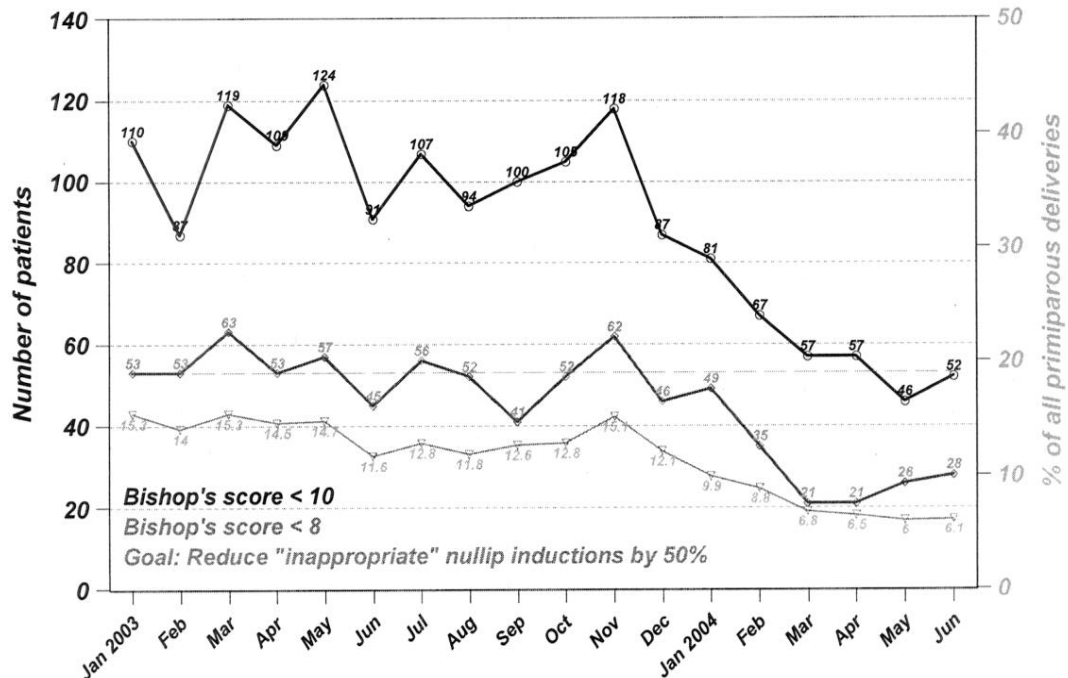


Exhibit 3. Inappropriate elective inductions for first deliveries (primiparous women), on the basis of Bishop's scores. The most important element is the blue line, showing the proportion of all primiparous women inappropriately electively induced falling from more than 15 percent to about 6 percent. Today, that number is less than 3 percent, reflecting the limitations of the underlying protocol.

## Overall c-section rate

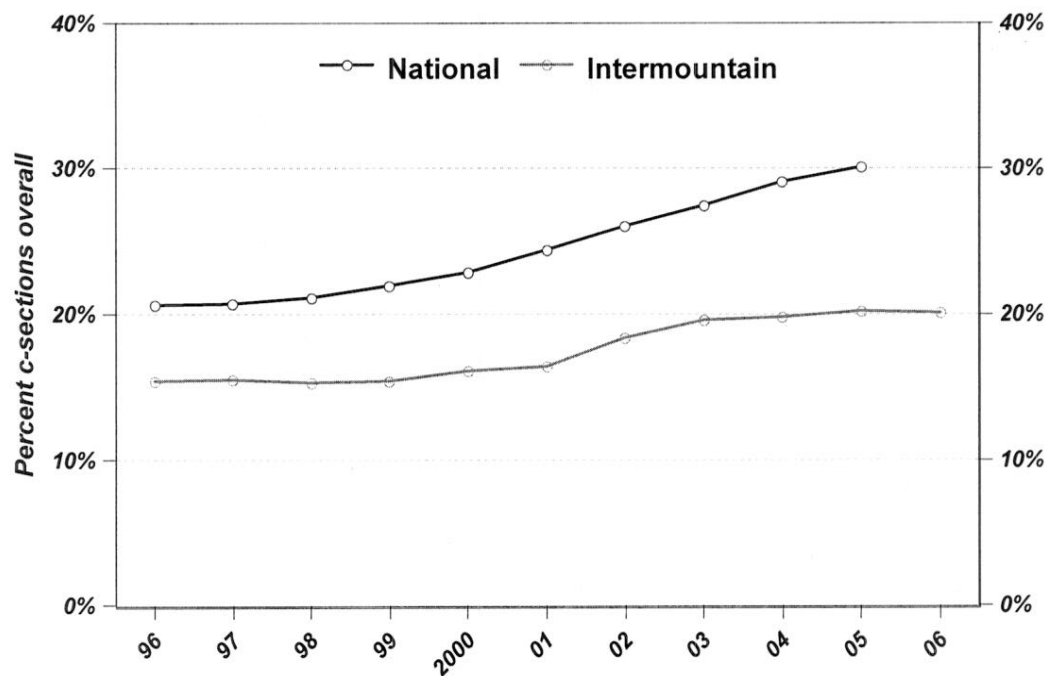


Exhibit 4. Intermountain's overall caesarean section rates, as compared to national rates.



## Elective induction: length of labor

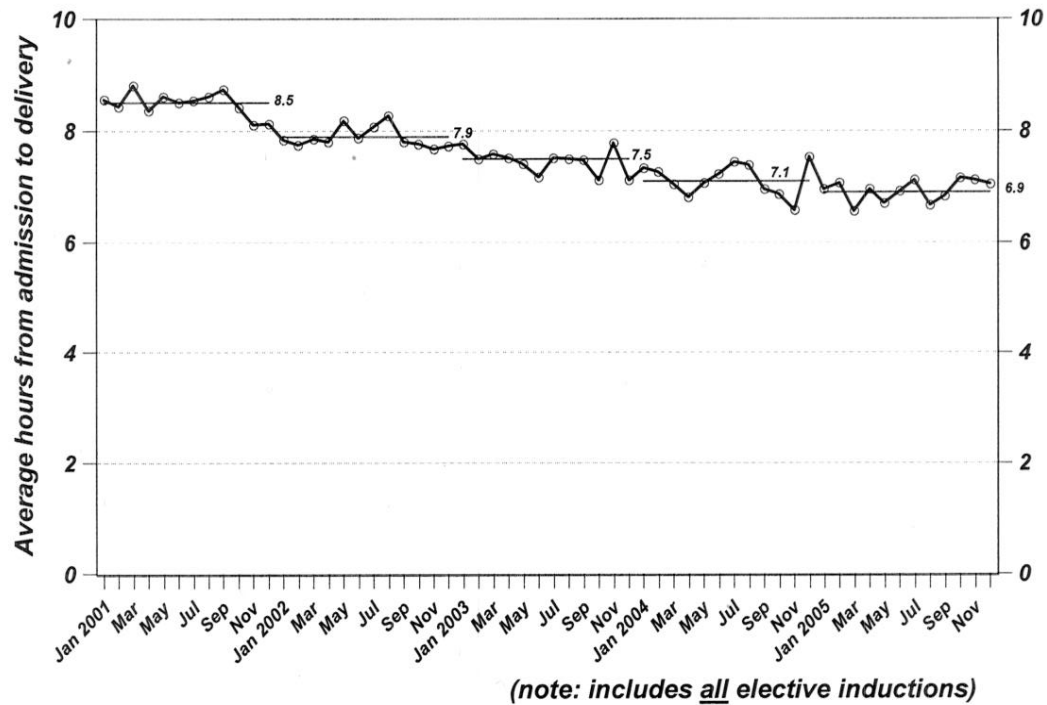


Exhibit 5. As the rate of inappropriate elective inductions declined, time in labor fell. Across the entire Intermountain system, the total drop was about 45,000 minutes of labor time per year.

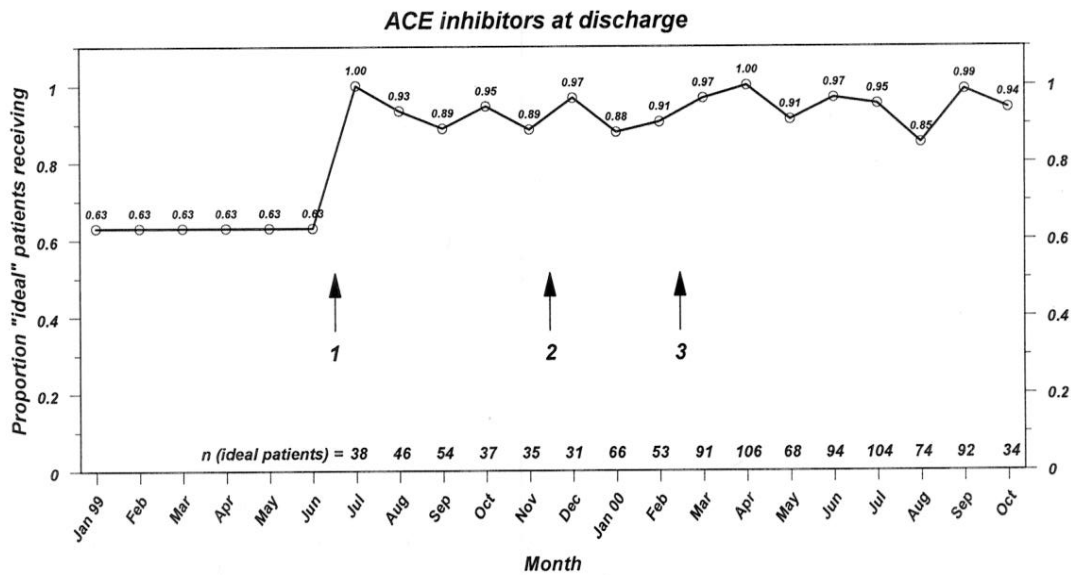
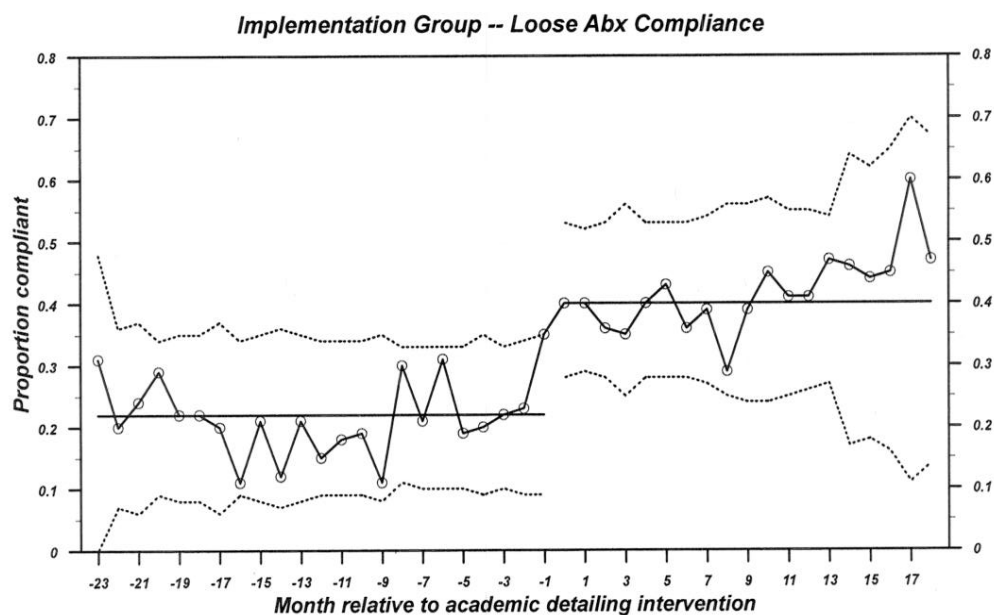


Exhibit 6. Prescription of beta blockers at hospital discharge, for patients with cardiac disease who had indications for the medication, but no contraindications ("ideal" patients). At time point 1, Intermountain's Cardiovascular Clinical Program implemented an evidence-based best practice guideline, blended into clinical workflow. At time point 2, the team deployed the protocol to Intermountain's 4 largest hospitals. At time point 3, the team put the content of the protocol in control of the nurses who implemented it. The nurses immediately made small changes that produced even better results. In subsequent steps (not shown on the graph), Intermountain deployed the protocol to all of its 22 adult facilities. Later still, after Intermountain began to hire clinical pharmacists for all facilities, execution of the protocol was shifted to that group.

	<u>Before</u>	<u>After</u>	<u>National 2000</u>
<b>Beta blockers</b>	57%	97%	41%
<b>ACE / ARB inhibitors</b>	63%	95%	62%
<b>Statins</b>	75%	91%	37%
<b>Antiplatelet</b>	42%	98%	70%
<b>Warfarin (chronic AFib)</b>	10%	92%	<10%

	<b>Mortality at 1 year</b>			<b>Readmissions w/ in 1 year</b>		
	<u>Before</u>	<u>After</u>		<u>Before</u>	<u>After</u>	
<b>CHF</b> (n = 19,083)	22.7%	17.8%	331	46.5%	38.5%	551
<b>IHD</b> (n = 43,841)	4.5%	3.5%	124	20.4%	17.7%	336
<b>Total</b>			455			887

Exhibit 7. Impact of implementation of cardiac medications protocol on patient one-year survival rates and re-hospitalization rates.



*P chart - 0.01 control limits*

Exhibit 8. Physician compliance with recommended antibiotic regimens for the initial treatment of community-acquired pneumonia, following implementation of an evidence-based best practice guideline.

## Community acquired pneumonia

	<u>without protocol</u>	<u>with protocol</u>	
"Outlier" (complication) DRG at discharge	15.3%	11.6%	↓ 24.7% p<0.001
In-hospital mortality	7.2%	5.3%	↓ 26.3% p=0.015
Relative resource units (RRUs) per case	55.9	49.0	↓ 12.3% p<0.001
Cost per case	\$5211	\$4729	↓ 9.3% p=0.002

Exhibit 9. Patient results following implementation of the Intermountain community-acquired pneumonia guideline.



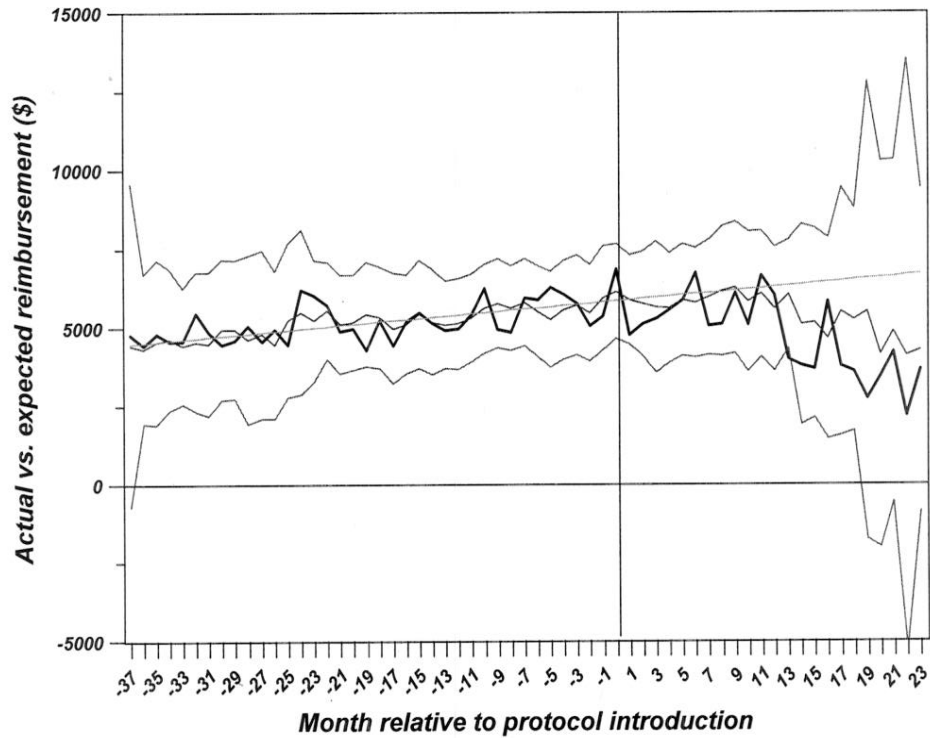


Exhibit 10. Cost and reimbursement consequences associated with implementation of the Intermountain community-acquired pneumonia guideline. The green line represents the expected per case cost of care, including medical inflation over time. The blue line shows the true per case cost of care. After implementation, complication rates fell, causing per case costs to also fall. The black line shows actual per case reimbursement. The vast majority of these cases were treated under the federal Medicare program.